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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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STALLMAN & POLLOCK LLP
353 SACRAMENTO STREET
SUITE 2200
SAN FRANCISCO, CA 94111

EXAMINER	
VAN ROY, TOD THOMAS	

ART UNIT	PAPER NUMBER
2828	

DATE MAILED: 04/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/643,621	ANIKITCHEV ET AL.	
	Examiner	Art Unit	
	Tod T. Van Roy	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 February 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-6,8-19 and 21-23* is/are rejected.

7)☒ Claim(s) *3,7,20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claim 17 is objected to because of the following informalities:

Claim 17 states "...section of diode-laser...", and is believed to more correctly read "...section of *said* diode-laser...".

Appropriate correction is required.

Response to Amendment

The examiner acknowledges the amending of claims 1, 14, 17-18 and 21, as well as the cancellation of claim 24.

Response to Arguments

Applicant's arguments, see Remarks, filed 02/16/2006, with respect to independent claims 1, 14, 17-18 and 21 have been fully considered and are persuasive. The rejection of these claims has been withdrawn.

The examiner agrees, that as amended, the independent claims overcome the previous rejections as written.

Please see below for an updated rejection to the claims based on the newly filed amendments.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-2, 4-6, and 8-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuniyasu et al. (US 6744797) in view of Tanaka (US 6430204) and further in view of Natasuka (US 4872175).

With respect to claim 1, Kuniyasu teaches a diode-laser having a longitudinal axis (fig.1D), comprising: a substrate (fig.1D #1) having two facets (fig.1D, front and rear), the distance between said facets defining the length of the diode laser, a lower cladding region (fig.1D #3), a lower waveguide region (fig.1D #4), an active region including a quantum-well layer (fig.1D #6), an upper waveguide region (fig.1D #8), and an upper cladding region (fig.1D #9,11), formed on said substrate; an elongated electrode electrically coupled to said upper cladding region and located between said facets and defining an elongated pumped section of the diode laser (fig.1D #17), said electrode having a length less than the length of the diode-laser (fig.1D #17) thereby leaving at least one un-pumped section adjacent said diode-laser at a first end of said electrode, the longitudinal axis of the diode-laser extending through said pumped and un-pumped sections of the diode-laser (as defined above), and at least one etched area

in said upper cladding region of said un-pumped section of diode-laser (fig.1D trenches), said etched area aligned with the longitudinal axis of the diode-laser and having a maximum depth less than or equal to the total thickness of said upper cladding region(not etched past #9). Kuniyasu does not teach the etched region to define a diverging lens structure, or the quantum-well layer to have a higher bandgap in said un-pumped region than in said pumped region. Natasuka teaches a laser device having etched diverging lens structures (taught to correct self-focusing, i.e. divergent, col.1 lines 53-57, col.2 lines 5-10) formed in the upper clad (col.2 lines 16-21) extending along the device length (fig.1, and 3-7, showing 1 of multiple lenses, col.4 lines 5-10) in the stripe region. Tanaka teaches a semiconductor laser device wherein an un-pumped region (col.20 lines 12-15) is at a higher bandgap than the pumped section (col.20 lines 29-34). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser device of Kuniyasu with the divergent lenses (extending inside the length of the ridge stripe, so would be found in the unpumped regions) of Natasuka in order to broaden the stripe width, lower light density, and heighten the light output (Natasuka, col.1 lines 45-52) as well as to encourage single mode operation (Natasuka, col.3 lines 20-25) and in addition to utilize the bandgap design of Tanaka in order to prevent catastrophic optical damage (Tanaka, col.20 lines 29-34).

With respect to claim 2, Kuniyasu, Nakatsuka, and Tanaka teach the laser device outlined in the rejection to claim 1, wherein the lenses of Nakatsuka are taught to be biconcave an a uniform depth (Nakatsuka, figs.1-2)

With respect to claim 4, Kuniyasu, Nakatsuka, and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the electrode to be positioned between said facets providing an un-pumped section of said laser diode at each end of said electrode (Kuniyasu, fig.1D #17).

With respect to claim 5, Kuniyasu, Nakatsuka, and Tanaka teach the laser device as outlined in the rejection to claim 4, and further teach there to be at least one said etched area in said cladding region in each of said un-pumped sections (lenses extend along full length of the device, so would be found in the unpumped regions).

With respect to claim 6, Kuniyasu, Nakatsuka, and Tanaka teach the laser device as outlined in the rejection to claim 5, and further teach the upper cladding region in each of said un-pumped sections to include the same number of said etched areas (inherent due to device symmetry).

With respect to claim 8, Kuniyasu, Nakatsuka, and Tanaka teach the laser device as outlined in the rejection to claim 5, and further teach the un-pumped regions to be at either end of the laser diode (Kuniyasu, fig.1D 1 un-pumped region near each facet).

With respect to claims 9 and 10, Kuniyasu, Nakatsuka, and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the electrode to be located with one end thereof adjacent to a said facet and with one un-pumped region between the facet and the electrode (Kuniyasu, col.9 lines 11-14).

With respect to claim 11, Kuniyasu, Nakatsuka, and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the active region, and

each of said waveguide and cladding regions to include at least one layer of a semiconductor material (Kuniyasu, col.3 lines 47-58).

With respect to claim 12, Kuniyasu, Nakatsuka, and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the electrode to have a width greater than about 30um (Kuniyasu, col.12 line 29).

With respect to claim 13, Kuniyasu, Nakatsuka, and Tanaka teach the laser device as outlined in the rejection to claim 1, but do not teach the electrode to have a length of between .5mm to 1.5mm. However these device, and electrode, lengths are well known in the art. The particular length used in Kuniyasu, Nakatsuka, and Tanaka does not appear critical to the operation of the device, therefore it would have been obvious to one skilled in the art to substitute the known length into the system of Kuniyasu, Nakatsuka, and Tanaka by an obvious engineering design choice.

With respect to claim 14, Kuniyasu, Nakatsuka, and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the device to include un-pumped sections adjacent to each end of said electrode (Kuniyasu, fig.1D un-pumped regions at either end of electrode #17).

With respect to claim 15, Kuniyasu, Nakatsuka, and Tanaka teach the laser device as outlined in the rejection to claim 14, and further teach there to be an un-pumped regions between ends of said electrode and said facets (Kuniyasu, fig.1D un-pumped regions at either end of electrode #17).

With respect to claim 16, Kuniyasu, Nakatsuka, and Tanaka teach the laser device as outlined in the rejection to claim 15, and further teach the upper cladding layer

in each of said un-pumped sections to include the same number of said etched areas (due to device symmetry).

With respect to claim 17, Kuniyasu, Nakatsuka, and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the shape, midline alignment, and depth of the etched profiles in said etched areas to be selected such that the laser diode operates in only a single transverse mode (Kuniyasu, col.7 lines 14-29, as well as Nakatsuka etched regions, col.3 lines 20-25).

Claims 18-19 and 21-23 are rejected under 35 U.S.C. 103(a) as being anticipated by Kuniyasu in view of Nakatsuka.

With respect to claim 18, Kuniyasu teaches a diode-laser having a midline longitudinal axis (fig.1D), comprising: a substrate (fig.1D #1) having two facets (fig.1D, front and rear), the distance between said facets defining the length of the diode laser, a lower cladding region (fig.1D #3), a lower waveguide region (fig.1D #4), an active region including a quantum-well layer (fig.1D #6), an upper waveguide region (fig.1D #8), and an upper cladding region (fig.1D #9,11), formed on said substrate; an elongated electrode electrically coupled to said upper cladding region and located between said facets and defining an elongated pumped section of the diode laser (fig.1D #17), said electrode having a length less than the length of the diode-laser (fig.1D #17) thereby leaving at least one un-pumped section adjacent said diode-laser at a first end of said electrode, the midline longitudinal axis of the diode-laser extending through said

pumped and un-pumped sections of the diode-laser (as defined above), and at least one etched area in said upper cladding region of said un-pumped section of said diode-laser (fig.1D trenches), said etched area aligned with the longitudinal axis of the diode-laser and having a maximum depth less than or equal to the total thickness of said upper cladding region(not etched past #9). Kuniyasu does not teach the etched region to define a diverging lens structure. Natasuka teaches a laser device having etched diverging lens structures (taught to correct self-focusing, i.e. divergent, col.1 lines 53-57, col.2 lines 5-10) formed in the upper clad (col.2 lines 16-21) extending along the device length (fig.1, and 3-7, showing 1 of multiple lenses, col.4 lines 5-10) in the stripe region. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser device of Kuniyasu with the divergent lenses (extending inside the length of the ridge stripe, so would be found in the unpumped regions) of Natasuka in order to broaden the stripe width, lower light density, and heighten the light output (Natasuka, col.1 lines 45-52) as well as to encourage single mode operation (Natasuka, col.3 lines 20-25).

With respect to claim 19, Kuniyasu and Nakatsuka teach the laser device as outlined in the rejection to claim 18, wherein the etched area has a uniform depth in the longitudinal direction (Nakatsuka, fig.2).

With respect to claim 21, Kuniyasu and Nakatsuka teach the laser device as outlined in the rejection to claim 18, and further teach the device to have a recessed area aligned with said un-pumped area having a configuration which modifies the

effective refractive index of the un-pumped area in order to improve mode performance (function of Nakatsuka's lenses, col.1 lines 53-56, col.3 lines 20-25).

With respect to claim 22, Kuniyasu and Nakatsuka teach the laser device as outlined in the rejection to claim 21, and further teaches the recessed area to be formed in an outer cladding area (Nakatsuka, col.2 lines 16-21).

With respect to claim 23, Kuniyasu, Nakatsuka, and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the quantum well layer in the un-pumped region to be a disordered structure (Tanaka, col.19 lines 50-63, wherein the ion implantation leads to the disordering of the well).

Allowable Subject Matter

Claims 3, 7, and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Claims 3 and 20 are believed to be allowable as a diode laser having the structure and pumped/unpumped alignment outlined in independent claims 1 and 18, wherein the diverging lens structure is formed of a rectangular shape defined with respect to the longitudinal axis was not found to be taught in the prior art, or an obvious combination of the prior art.

Claim 7 is believed to be allowable as changing the symmetry of Kuniyasu and Nakatsuka in order to have a different number of divergent lens structures in either of the unpumped regions was not found to be taught in the prior art, or an obvious combination of the prior art.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TVR

MINSUN CHI HARVEY
PRIMARY EXAMINER